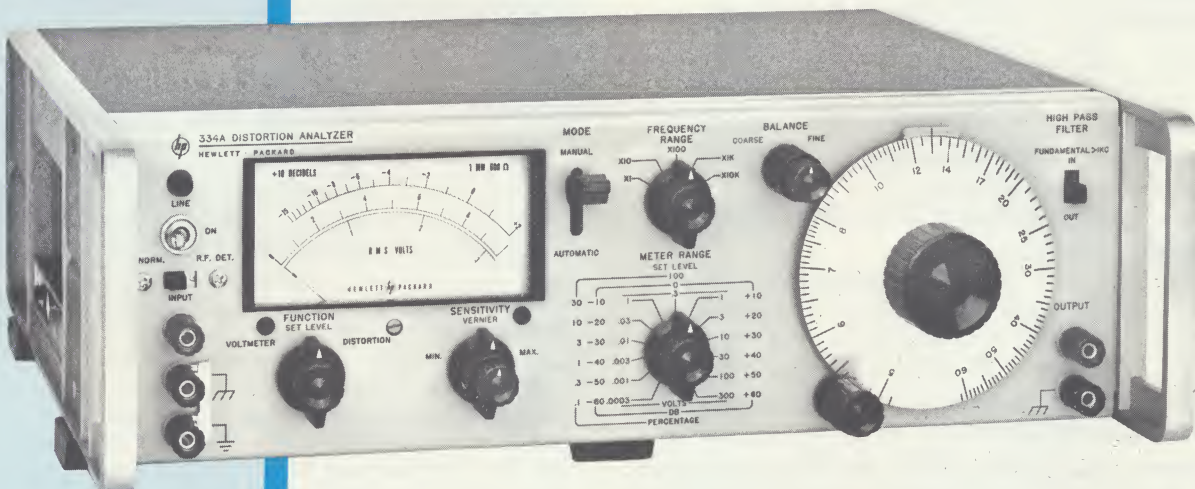


TECHNICAL DATA 4 AUG 65

Revised



- HARMONIC DISTORTION MEASUREMENT FROM 5 cps-600 kc, 0.1% FULL SCALE DISTORTION SENSITIVITY
- AUTOMATIC FUNDAMENTAL NULLING
- INPUT SENSITIVITY 0.3V rms FOR 100% SET LEVEL REFERENCE
- MAX. VOLTMETER FULL SCALE SENSITIVITY 300 μ v rms (RESIDUAL NOISE < 25 μ V)

P. O. Box 301, Loveland, Colorado, 80537, Tel. (303) 667-5000



Europe: 54 Route Des Acacias, Geneva, Switzerland, Cable: "HEWPACKSA" Tel. (022) 42.81.50

MODELS AND AVAILABLE FEATURES

Model No.	Automatic Fundamental Nulling	Hi-Pass Filter	AM Detector	Gear Reduction Tuning	VU Meter	Rear Input Terminals In Parallel
331A				X	Option: 01	Option: 02
332A			X	X	Option: 01	Option: 02
333A	X	X			Option: 01	Option: 02
334A	X	X	X		Option: 01	Option: 02

X Standard feature on models indicated. Options available on special order.

ADVANTAGES

- 1 Megohm input impedance
- Low distortion output for oscilloscope or true RMS voltmeter
- High reduction gear drive aids manual tuning
- Switchable High-Pass Filter attenuates all frequencies below 400 cps.
- Common input terminals for Voltmeter and Distortion Analyzer
- Floating Input and Output
- Solid State

USES

- Measure total broadband distortion
- Measure voltage and amplifier gain
- Measure noise and hum level
- Measure envelope distortion of AM RF carriers
- High-Gain, wide-band amplifier

DESCRIPTION

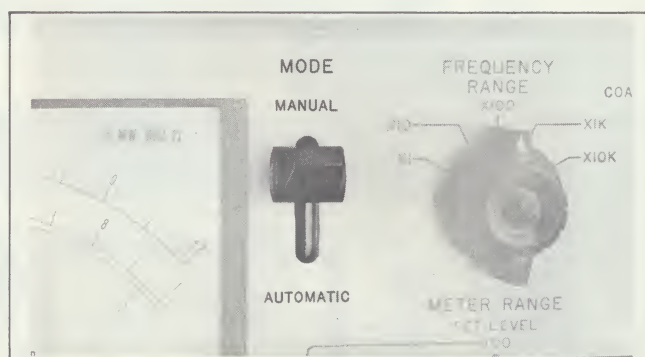
Distortion Analyzers have gone solid state, offering extended tuning range, greater set-level sensitivity, improved selectivity and greater overall accuracy. The Model 331A, 332A, 333A, 334A Distortion Analyzers measure total distortion down to 0.1% full scale at any frequency between 5 cps and 600 kc; harmonics are indicated up to 3 mc. These instruments measure noise as low as 50 microvolts, and measure voltages over a wide range of level and frequency. All four models may be used as sensitive wide range transistorized voltmeters for general purpose voltage and gain measurements.

DISTORTION ANALYZER

The Distortion Analyzer consists of a high impedance broadband amplifier, a tunable frequency rejection circuit, and a metering circuit. The solid state rejection circuit utilizes a capacitively tuned Wien bridge network which provides greater than 80 db of fundamental rejection. Automatic bridge balancing (fundamental nulling) is available in the Φ Models 333A and 334A. Maximum input sensitivity at 0.1% distortion setting corresponds to 300 μ v rms for measuring low-level residuals. Input impedance is one megohm for both voltmeter and distortion operation with a single input terminal being used for both modes of operation.

AUTOMATIC FUNDAMENTAL NULLING

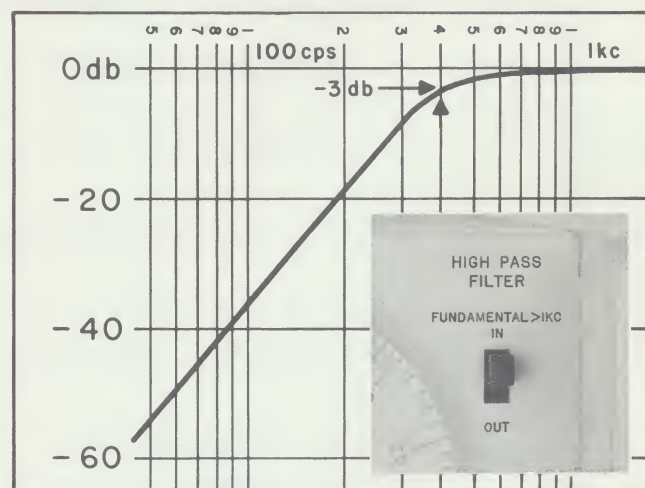
Automatic fundamental nulling speeds up the normally time-consuming portion of the measurement. This is done by manually nulling with the coarse tuning and balance controls to less than 10% of the Set Level Reference. The automatic mode is used to complete rejection of the fundamental on more sensitive ranges without any further manual tuning.



Mode Switch on 333A and 334A provides Automatic Fundamental Nulling.

HIGH-PASS FILTER

In order to reduce the effect of hum components, a high pass filter is provided which attenuates frequencies below 400 cps. The filter may be activated by a front panel switch when measuring distortion of signals greater than 1 kc in frequency.

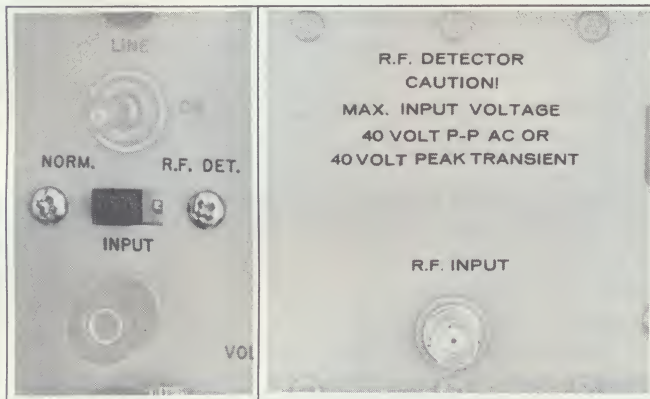


Switchable High-Pass Filter attenuates all frequencies below 400 cps eliminating hum and noise components illustrated in the typical curve above.

AMPLITUDE MODULATION DETECTOR

The Model 332A or the 334A Analyzers are provided with an amplitude modulation detector having a frequency range from 500 kc to greater than 65 mc.

The high impedance dc restoring peak detector which utilizes a semi-conductor diode measures distortion at carrier levels as low as 1 volt. The input to the detector is located on the rear of the instrument. The Model 334A is similar to Model 332A, but is provided with Automatic Fundamental Nulling and a High-Pass Filter.



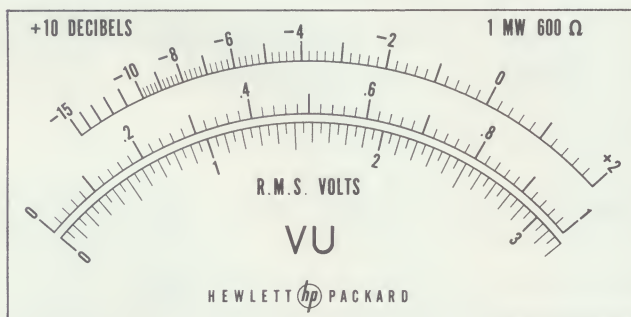
Switchable RF Detector to the input of the instrument has a frequency range of 500 kc to 65 mc. Input connector is located in the rear of the instrument.

HIGH IMPEDANCE VOLTMETER

The transistorized metering circuit of the Model 331A through 334A, employs a large amount of feedback to insure stability and a flat frequency response from 5 cps to 3 mc. The voltmeter mode offers 13 ranges in 10 db steps. Range is from 300 μ v to 300V rms full scale. The bandwidth is 5 cps to 3 mc for the 1 mv to 30 v ranges, 5 cps to 500 kc for the 100v to 300v ranges, and 20 cps to 500 kc for the 300 μ v range. The average responding meter is calibrated to the rms value of a sine wave.

VU OPTION AVAILABLE

OPTION: 01 provides an indicating meter having VU ballistic characteristics.



VU Meter Scale

REAR TERMINAL OPTION AVAILABLE

OPTION: 02 provides rear terminals in parallel with the front input terminals for direct connection to the analyzers at the rear when rack mounting and used in a system.

MODEL 331A

Distortion Measurement Range: Any fundamental frequency, 5 cps to 600 kc. Distortion levels of 0.1%-100% are measured full scale in 7 ranges.

Distortion Measurement Accuracy:

Harmonic measurement accuracy:

Fundamental Input Less Than 30 v

RANGE	$\pm 3\%$	$\pm 6\%$	$\pm 12\%$
100%-0.3% F.S.	10 cps-1 mc	10 cps-3 mc	
0.1% F.S.	30 cps-300 kc	20 cps-500 kc	10 cps-1.2 mc

Fundamental Input Greater Than 30 v

RANGE	$\pm 3\%$	$\pm 6\%$	$\pm 12\%$
100%-0.3% F.S.	10 cps-300 kc	10 cps-500 kc	10 cps-3 mc
0.1% F.S.	30 cps-300 kc	20 cps-500 kc	10 cps-1.2 mc

Elimination Characteristics:

Fundamental Rejection > 80 db

Second Harmonic Accuracy for a fundamental of:

5 to 20 cps: better than +1 db

20 cps to 20 kc: better than ± 0.6 db

20 kc to 100 kc: better than -1 db

100 kc to 300 kc: better than -2 db

300 kc to 600 kc: better than -3 db

Distortion Introduced by Instrument:

<0.03% from 5 cps to 200 kc

<0.06% from 200 kc to 600 kc

Meter indication is proportional to the average value of a sine wave.

Frequency Calibration Accuracy:

Better than $\pm 2\%$ from 10 cps to 200 kc

Better than -3% from 5 to 10 cps

Better than +8% from 200 to 600 kc

Input Impedance: Distortion Mode: 1 Megohm shunted by less than 60 (*80) pf (10 megohms shunted by <10 pf with Model 10001A divider probe).

Voltmeter Mode: 1 Megohm shunted by 30 pf (*50) 1 to 300 v rms; 1 Megohm shunted by 60 pf (*80), 300 μ v to 0.3v rms.

*Option: 02

Input Level For Distortion Measurements: 0.3v rms for 100% set level or 0.245 v for 0 db Set Level. (up to 300 v may be attenuated to set level reference).

DC Isolation: Signal ground may be ± 400 vdc from external chassis.

Voltmeter Range: 300 μ v to 300 v rms full scale (13 ranges) 10 db per range.

Voltmeter Accuracy:

RANGE	$\pm 2\%$	$\pm 5\%$
300 μ v	30 cps-300 kc	20 cps-500 kc
1 mv-30v	10 cps-1 mc	5 cps-3 mc
100v-300v	10 cps-300 kc	5 cps-500 kc

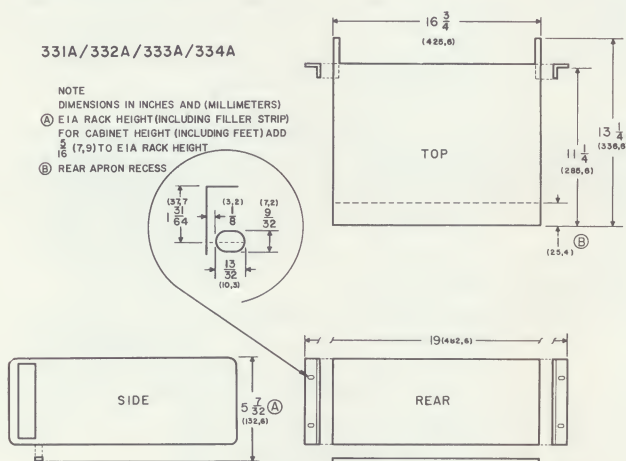
Noise Measurements: Voltmeter residual noise on the 300 μ v range: <25 μ v rms, when terminated in 600 ohms, <30 μ v rms terminated with a shielded 100 k resistor.

Output: Approximately 0.1 v rms output for full scale meter deflection.

Output Impedance: 2K.

Power Supply: 115 or 230 volts $\pm 10\%$, 50 to 1000 cps, approximately 4 watts. Terminals are provided for external battery supply. Positive and negative voltages between 28v and 50v are required. Current drain from each supply is 40 ma.

Outline Drawing:



Weight: Net 17 3/4 lbs. (7,98 kg) Shipping 23 lbs. (10,35 kg).

MODEL 332A

Same as Model 331A except as indicated below:

AM Detector: High impedance DC restoring peak detector with semi-conductor diode operates from 500 kc to greater than 65 mc. Broadband input, no tuning is required.

Maximum Input: 40 v p-p AC or 40 v peak transient.

Distortion Introduced By Detector:

Carrier Frequency:

550 kc - 1.6 mc: $< 0.3\%$ for 3-8 v rms carriers modulated 30%.

1.6 mc - 65 mc: $< 1\%$ for 3-8 v rms carriers modulated 30%.

Note: Distortion introduced at carrier levels as low as 1 volt is normally $< 1\%$ 550 kc to 65 mc for carriers modulated 30%.

MODEL 333A

Same as Model 331A except as indicated below:

Automatic Nulling Mode:

Set Level: At least 0.2 v rms.

Frequency Ranges:

X1, manual null tuned to less than 3% of set level; total frequency hold-in $\pm 0.5\%$ about true manual null. X10 through X10 K, manual null tuned to less than 10% of set level; total frequency hold-in $\pm 1\%$ about true manual null.

Automatic Null Accuracy:

5 cps to 100 cps: Meter reading within 0 to +3 db of manual null.

100 cps to 600 kc: Meter reading within 0 to +1.5 of manual null.

High-Pass Filter: 3 db point at 400 cps with 18 db per octave roll off. 60 cps rejection > 40 db. Normally used only with fundamental frequencies greater than 1 kc.

Frequency Calibration Accuracy:

Better than $\pm 3\%$ from 5 cps to 200 kc

Better than $+8\%$ from 200 kc to 600 kc

Power Supply: Same as Model 331A except current drain from each supply is 80 ma.

MODEL 334A

Same as Model 333A except includes AM Detector described under Model 332A.

Price: 331A \$590.00

332A \$620.00

333A \$760.00

334A \$790.00

Option: 01, Indicating meter has VU characteristics conforming to FCC requirements for AM/FM and TV broadcasting; add \$15.00.

Option: 02, Rear input terminals in parallel; add \$20.00.

Prices f.o.b. factory
Data subject to change without notice
► Indicates change from prior specifications

8 MAR 65
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